INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU03/01313

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: C30B 28/02, 29/06, H01L 31/18, 21/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
DWPI, JAPIO; (polysilicon, poly silicon, polycrystalline semiconductor, polycrystalline silicon etc), (amorphous semiconductor etc), (heat+, thermal+, anneal+), (metal induced crystalli+), (metal or aluminium etc (s) layer+ or film?), (heteroepitax+), (+etch+), (seed+ or nucleat+ (s) layer+ or film?), (thermal budget), (remov+ or clean+ (s) surface), (form+, deposit+, grow+), (inclusion? or island?), (solid phase epitaxy, spe), overlayer

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6383851 B2 (PING) 7 May 2002 See the abstract, col 3 line 20-40	57-90
X	US 6251715 B1 (JUNG et al) 26 June 2001 See the abstract	57-90
X	US 5344796 A (SHIN et al) 6 September 1994 See the abstract	57-90

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 December 2003	23 DEC 2003
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer I.A.BARRETT Telephone No : (02) 6283 2189

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6451637 B1 (JANG et al) 17 September 2002 See the abstract	
A	US 6248675 B1 (XIANG et al) 19 June 2001 See the abstract	
A	US 5275851 A (FONASH et al) 4 January 1994 See the abstract, col 3 line 16-41	
A	EP 1271620 A1 (KIM) 2 January 2003 See the abstract	
A	Journal of Crystal Growth, Volume 242, Issues 3-4, issued July 2002, (Elsevier), WIDENBORG et al, "Surface Morphology of poly-Si films made by aluminium-induced crystallisation on glass substrates", pages 270-282	
A	Solar Energy Materials and Solar Cells, Volume 69, Issue 2, issued September 2001, (Elsevier), NIIRA et al, "Thin film poly-Si formation for solar cells by Flux method and Cat-CVD method", pages 107-114	
A	Applied Physics Letters, Volume 73, Number 22, issued 30 November 1998, (American Institute of Physics), NAST et al, "Aluminum-induced crystallisation of amorphous silicon on glass substrates above and below the eutectic temperature", pages 3214-3216	
A	Journal of Applied Physics, Volume 88, Number 2, issued 15 July 2000, (American Institute of Physics), NAST et al, "Influence of interface and Al structure on layer exchange during aluminum-induced crystallization of amorphous silicon", pages 716-724	

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Box I **Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos :

because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos :

because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos :

because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box II **Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

There are two inventions covered by claims 1-56 and 57-90. Both methods relate to formation of polycrystalline semiconductor layers.

Continued on extra sheet.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims

2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

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Supplemental Box
(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box No:

The method of claims 1-56 is characterised by special technical features :-

(a) depositing a metal film onto a target surface

(b) forming a metal oxide or hydroxide film on the metal layer

(c) forming a layer of amorphous semiconductor material over the metal oxide or hydroxide

(d) heating to form a polycrystalline semiconductor layer by metal induced crystallisation

(e) removing metal and metal oxide or hydroxide from an overlayer over the polycrystalline semiconductor layer

(f) removing freestanding semiconductor "islands" from the surface of the polycrystalline semiconductor layer.

The method of claims 57-90 is characterised by special technical features :-

(g) forming a polycrystalline semiconductor seed layer on a target surface

(h) cleaning the surface of the seed layer

(i) forming an amorphous semiconductor layer over the seed layer

(j) heating to crystallise the amorphous semiconductor layer by solid phase epitaxy.

Both methods relate to formation of polycrytalline semiconductor layers from amorphous semiconductor layers which is well known in the prior art and acknowledged in the description. While both methods result in a polycrystalline semiconductor layer, there do not appear to be any special technical features linking the two methods.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
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This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
US	6383851	US	6204156	US	2001009799	US	2002115243
US	6251715	US	5858820				
US	5344796	JP	6204137				
US	6451637	KR	2000008068	KR	2000026624	KR	2000052007
		US	2002098297				
US	6248675						
US	5275851						
EP	1271620	JP	2003007638	US	2003010775		

END OF ANNEX